DECOMMISSIONING LESSONS LEARNED

Jeff Lux, Project Manager
Kerr-McGee Corporation

October 18, 2005

Introduction

Kerr-McGee appreciates the opportunity to present lessons learned during decommissioning to NRC. We believe NRC's efforts to gain input from the regulated community, as well as other stakeholders, will enhance NRC's ability to expedite the decommissioning of licensed sites, saving money without sacrificing quality or the safety of workers or the public. During this presentation, I will describe some of the lessons learned not only at the sites for which Kerr-McGee has performed decommissioning operations, but for other fuel cycle facilities of which I am aware.

Flexibility is Needed

It appears that NRC personnel sometimes "default" to the most rigid interpretation of regulations and/or regulatory guidance. This may be the most "secure" position for NRC staff, but it often impedes progress in decommissioning. NRC must be willing to exercise discretion when allowed to expedite the decommissioning process, while ensuring that safety and quality are not compromised.

Some fuel cycle facilities are undergoing decommissioning in accordance with decommissioning plans which were approved prior to August 20, 1999. These plans are "grandfathered" under Subpart E of 10 CFR 20, the License Termination Rule (LTR). 10 CFR 70.38 addresses the need for a "new" decommissioning plan, a circumstance which would "trigger" the LTR. Unnecessarily conservative interpretation of 10 CFR 70.38 has brought the decommissioning of one facility to a virtual halt.

Inconsistent interpretation of the timeliness rule has resulted in some licensees being forced to decommission interior portions of their facility when it would have been more appropriate to perform "source removal", deferring decommissioning until cessation of operation. Fortunately, the Decommissioning Directorate has recommended a solution to some of the timeliness rule problems expressed by licensees, which fuel cycle licensees believe may address this problem.

Many licensees do not release solid materials unless it is indistinguishable from background because of uncertainty regarding what NRC would consider releasable. Kerr-McGee was able to combine "final status survey" quality measurements with the concept of unrestricted release to expedite decommissioning of volumetrically contaminated waste at the Cushing site. Basing release of volumetrically contaminated solid materials on DCGLs calculated for soils alleviated this problem in this situation.

Characterize with the Process in Mind

At Kerr-McGee's Cushing site, MARSSIM survey methodology was used to delineate material exceeding decommissioning criteria. For soils, this proved to be a relatively unsuccessful effort. Scanning instruments are only capable of identifying licensed

material in shallow soils (top eight inches or less). Consequently, the systematic scanning and sampling described in MARSSIM can not delineate heterogeneously distributed licensed material if it extends below the surface.

Because of the heterogeneous distribution of licensed material at the Cushing site (typical for fuel cycle facilities), the systematic characterization sampling required excavation of volumes of material averaging below the decommissioning criteria; characterization samples often represented a small "hot spot" in the midst of mostly low-activity or background-level soil. Because the decommissioning process required scanning of excavations in-process, material not identified during characterization was discovered in discrete layers or trenches; this material also required removal. As a result, the volume of material removed far exceeded estimates based on site characterization, and most of the material shipped did not exceed the decommissioning criteria.

Though millions of dollars were spent on characterization, the result was a false impression of accuracy in defining and quantifying material requiring decommissioning. The lesson learned was that decommissioning process must be considered in the development of site characterization plans. If in-process measurements are to be used, characterization should only identify "starting points" for decommissioning, not attempt to quantify the material exceeding the criteria. Kerr-McGee could have saved substantial time and money on characterization with no effect on the end result if site characterization were designed only to identify the "starting points" for excavation.

Plan for "In-Process" Measurement and Material Segregation

NRC has begun utilizing in-process inspections and confirmation of measurements to verify that the licensee's program and measurements ensure compliance with requirements. At one of our sites, NRC has discontinued confirmatory surveys after final status survey because our program has consistently proven to generate good measurements supported by an effective QA/QC program. The decision to rely on these "in-process" measurements, rather than post-decommissioning confirmatory surveys will expedite license termination – with no degradation in NRC's confidence that the site complies with decommissioning criteria.

At the Cushing site, approving in-process (post-excavation) segregation of material resulted in a substantial reduction in the amount of "clean" material shipped for disposal, which translates to substantial cost savings – once again, with no reduction in safety or impact to human health or the environment. NRC should provide for in-process segregation both to minimize cost and to minimize the amount of "clean" material disposed of in facilities with limited capacity.

In one phase of decommissioning performed in 2002, the NRC-approved decommissioning plan required scanning of excavations to determine if licensed material exceeding decommissioning criteria (not identified during characterization) was present. All material excavated on the basis of characterization, as well as all material

identified by in-process scans, was shipped off site for disposal at a licensed facility. Characterization indicated that 20,078 cubic yards of material required removal and shipment. Of this volume, 13,625 cubic yards had previously been stockpiled and could be accurately quantified. The actual volume shipped was 26,908 cubic yards, meaning that the less than 7,000 cubic yards estimated in the field grew to over 13,000 cubic yards actually removed.

In the final phase of decommissioning, performed in 2003 and 2004, still more extensive characterization (in accordance with MARSSIM) indicated that 10,077 cubic yards required removal and shipment. The actual volume shipped was 19,820 cubic yards.

Fortunately, in the late stages of this final phase of decommissioning, NRC approved a Kerr-McGee proposal to modify the decommissioning process. Each bucket of soil was scanned during excavation; material that exceeded a pre-determined threshold was shipped, and the rest was spread in lifts. The lifts were scanned for material exceeding the threshold, and higher activity material was segregated for disposal. Over 5,400 cubic yards of soil were processed by this method, from which 1,249 cubic yards were "culled out" for shipment. This resulted in reducing the amount of material shipped by over 4,000 cubic yards. Even with this additional segregation effort, only 53% of the containers shipped yielded an average activity exceeding decommissioning criteria.

At the Cushing site, NRC twice approved changes in the decommissioning process that reduced the cost and time required for decommissioning portions of the site - with no reduction in safety or impact to human health or the environment. The lesson learned is that licensees and NRC need to provide for modifications to decommissioning processes when alternate methods offer potential for substantial savings in cost, time, or quantity of material segregated for disposal. This not only saves money and time, but can reduce the quantity of material being sent to disposal facilities with limited capacity.

<u>Focus on Performance-Based Decommissioning</u>
We recognize that NRC must ensure that licensees:

- Utilize qualified personnel,
- Implement an effective radiation safety program,
- Perform decommissioning activities in a manner protective of workers and the public,
- Control the use and spread of licensed material, and
- Are able to adequately fund decommissioning.

NRC must also ensure that DCGLs are appropriate, and that DCGLs are met prior to license termination.

Licensees must develop and implement plans that will decommission the site safely and in compliance with regulatory requirements. Licensees must continue decommissioning until they are able to demonstrate compliance with decommissioning criteria.

NRC requires that licensees provide and NRC approve site decommissioning plans before licensees can decommission sites. However, regulations do not specify the level of detail required by the plans, or the level of detail NRC must approve. NRC review and approval of detailed aspects of the decommissioning process (e.g, specified processes or procedures) reduces the licensee's flexibility to improve decommissioning processes or adjust to changed conditions. As long as licensees demonstrate organizational competence and technical proficiency, NRC should require that licensees safely meet established decommissioning criteria and provide licensees the greatest flexibility possible to plan and perform decommissioning.

A related principle is the concept that inactivity is expensive. When NRC reviews are performed at a detailed technical level, approval of decommissioning plans can take years. I am aware of one licensee whose decommissioning plan has been under review for five years, through two changes in project management. For licensees who have ceased operation, the cost of "being under license" can exceed one million dollars per year, even if little or no field work is being performed on site.

Licensees are beginning to fear the "rotational duty" announcement, which implies that they will be educating yet another project manager on their site, their license amendment requests, and any other proposals or approvals they need to get the job done. NRC must ensure that sufficient manpower, knowledgeable about site conditions, are available for timely review of submittals. Protracted review time delays decommissioning and increases costs with no commensurate benefit.

<u>Derive Reasonable Multi-Media DCGLs</u>

For naturally occurring radionuclides, DCGLs based on default exposure scenarios can be, for all practical purposes, indistinguishable from variability in background. This was demonstrated by a joint NRC/ORISE/EML research project conducted at the Cushing site in 1996. During that project, two background areas were surveyed as well as one impacted area. One of the two background areas was selected as the "reference" survey unit to which the others were statistically compared. The report concluded that, had the other background area been selected as the "reference" area, the first background area would have required remediation. In other words, MARSSIM methodology can statistically distinguish between even very small differences in the radioactivity of two areas, but it cannot tell if the difference is due to contamination or variability in background.

Because of this inability, inherent in statistical comparisons such as those performed for MARSSIM, NRC must ensure that reasonable exposure scenarios are employed in the derivation of DCGLs for naturally occurring radionuclides. In essence, DCGLs must be high enough that contamination can be distinguished from variability in background.

Reasonable distributions for key parameters must be utilized to develop probabilistic DCGLs rather than deterministic DCGLs, if only to minimize the potential for decommissioning unimpacted soils.

Although NUREG-1757 provides flexibility, it has been NRC's practice not to approve derived DCGLs until characterization is complete. This is problematic, because licensees cannot be sure that characterization is complete until they know the DCGL. DCGLs can be determined without extensive site characterization. Licensees need only know the isotopes of concern, the affected media, the exposure scenario, and in some cases certain hydrogeological and/or geochemical parameters, to calculate DCGLs. DCGLs should be established prior to characterization, because characterization can be most effectively planned based upon known DCGLs.

Finally, DCGLs should be developed for all media, and should consider the interrelationships between media. For example, DCGLs have at times been derived for soils without knowledge concerning what concentration of licensed material in soil would generate groundwater exceeding groundwater DCGLs. As a result, areas were decommissioned from a "buildings and soils" perspective, only to later find that the decommissioned area continues to be a source of impact to groundwater. It appears that both licensees and the NRC are just beginning to understand the impact of one media on the others, and to address these "holistically".

Involve Licensees in the EPA MOU Notification Process

Kerr-McGee is the licensee for two of the sites for which some type of notification is being made in accordance with the NRC-EPA Memorandum of Understanding. We believe the process, as implemented to date, can have a direct impact on the decommissioning process.

It is in all parties' interest (NRC, EPA, licensee) to ensure that information transmitted in both notifications and consultations is accurate and relevant. Licensee input into NRC's notification could have avoided the transmittal of inaccurate information at one of our sites. Obviously, inaccurate information is a concern to licensees, particularly if that information incorrectly implies that residual contamination could be of concern to EPA.

In addition, NRC could provide information which may not influence NRC's decision to approve a decommissioning plan or terminate a license, but which could be meaningful to EPA. Examples include:

- the involvement of State environmental regulatory agencies in the development of a decommissioning plan or the decommissioning of a site,
- development of DCGLs using both NRC guidance for dose-based limit derivation and EPA guidance for risk-based limit derivation, and
- previous or existing EPA involvement in the licensed site.

Licensees would be willing to provide such information to NRC, should NRC not already be aware of such issues. Including this type of information in notifications and consultations can only enhance the effectiveness of the implementation of the Memorandum of Understanding, and provide licensees greater assurance that their site is being fairly represented from both NRC's and EPA's perspectives.

Finally, NRC must understand that licensees are **very** concerned about the information NRC provides EPA. Inaccurate or misleading information could cause licensees to consider license termination little more than an invitation to EPA to force further remedial action under CERCLA. For this reason, inaccurate or misleading information could cause licensees to slow down or defer decommissioning to delay license termination until they are assured that EPA has an appropriate understanding regarding conditions at the site. This is certainly neither NRC's nor the licensees' desire, and only ensuring that EPA is provided an accurate, complete, and relevant description of the site is likely to alleviate this concern.

Interact with the Regulated Community

As a member of the Fuel Cycle Facilities Forum (FCFF), I appreciate the fact that NRC Decommissioning Directorate staff, as well as other NRC personnel, sometimes attend these meetings. This voluntary industry group is composed of fuel cycle licensees who meet to discuss decommissioning issues. Regulatory developments, implementation of regulatory guidance, technical issues associated with decommissioning, and "lessons learned" are all topics which the FCFF addresses at essentially every meeting. Members of the Nuclear Energy Institute and the National Mining Association often attend these meetings as well.

When NRC personnel attend these meetings, licensees and NRC staff are able to discuss technical and regulatory concerns, the potential impact of pending regulatory developments, and approaches that licensees or NRC have proposed in an effort to overcome obstacles to effective decommissioning. As a result, licensees gain a better understanding of and appreciation for NRC concerns. I believe NRC staff gain a better understanding of the issues confronting licensees.

I encourage the Commission to support the continued involvement by NRC personnel in these and other similar vehicles, which provide an opportunity for effective interchange.

Continue to Identify and Address Problematic Issues Through the IDIP

The Integrated Decommissioning Improvement Program (IDIP) has already identified several issues for which NRC must take action to facilitate licensees' efforts to decommission their facilities and sites. Examples already being addressed in the recent revision of NUREG-1757, Consolidated Decommissioning Guidance, include:

- Intentional mixing
- The use of reasonable exposure scenarios
- Alternatives to restricted release

Other issues are and will continue to be identified, and I believe the IDIP is the appropriate vehicle through which to develop resolutions to these issues. A few examples follow.

For operating facilities, decommissioning has been required for discontinued operation in a portion of a facility, when source removal would have been more appropriate, such as when the area was surrounded by other licensed operations.

Some licensees have had portions of their sites released, only to discover later that the release may be removed if the LTR is triggered, or if the residual dose from portions of the site which have not yet been released are too high. Obviously, this causes licensees concern regarding finality.

Although it is often reasonable to subdivide sites into discrete areas for decommissioning purposes (MARSSIM provides for this), NRC allows this in some cases and disallows it in others. Once again, it appears to licensees that the difference usually lies in the interpretation of regulations or regulatory guidance rather than in substantive differences in the technical basis of the approach.

There appears to be confusion regarding licensees' ability to dispose of licensed material at non-licensed facilities regulated by EPA or State environmental regulatory agencies. NRC's policy regarding such disposition needs clarification.

Conclusions

Both NRC and licensees are "learning lessons" as we gain experience in decommissioning.

Challenges still lie ahead. These challenges represent opportunities for both NRC and licensees to improve the process.

The Integrated Decommissioning Improvement Program may prove to be an effective vehicle for continued progress.